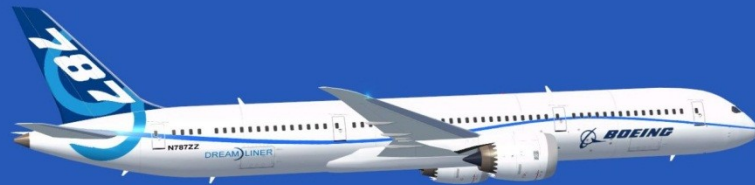
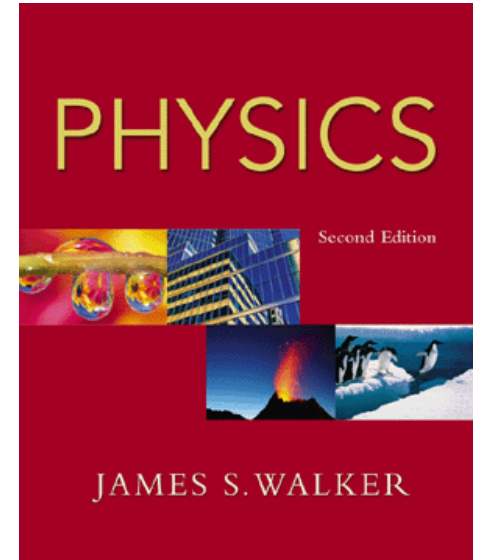


Air Resistance



What Falls Faster?



They all fall at the same rate!

How Is It Possible?

▮ Air Resistance

- Force in the opposite direction of the motion of an object through air
- Also called drag
- Can be affected by air, motion of object, and object

▮ Gravity

- The force that causes objects to move towards the center of the earth
- Acts evenly all over the world, so all objects fall at the same rate
- Different on different planets

Kinematic Equations

- ▮ Relate distance traveled, velocity, acceleration and time for us to make sense of the information
- ▮ For this experiment we can use the distance travelled, starting velocity, and time to figure out the acceleration of an object
- ▮ Can we use it with objects that didn't travel in a straight line?
 - no

Kinematic Equations

Equation	Missing Quantity
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$$v = v_0 + at$$

$$x - x_0$$

$$x - x_0 = v_0 t + \frac{1}{2}at^2$$

$$v$$

$$v^2 = v_0^2 + 2a(x - x_0)$$

$$t$$

$$x - x_0 = \frac{1}{2}(v_0 + v)t$$

$$a$$

$$x - x_0 = vt - \frac{1}{2}at^2$$

$$v_0$$

x_0 = initial position

x = final position

v_0 = initial velocity

v = final velocity

a = acceleration

t = time

Why Do Some Things Hit Earth Harder?

- ▮ Newton's Second Law of Motion
 - Force is equal to mass times acceleration
 - $F = m \cdot a$
- ▮ Force
 - A push or a pull on an object resulting in interactions with another object
- ▮ Mass
 - The amount of matter that there is in an object
 - Not the same as weight!
- ▮ Acceleration
 - Measure of the change in velocity over a certain amount of time
- ▮ Example: The difference between getting hit with a lacrosse ball and a tennis ball

Experiment

- ▮ Observe the difference in how objects fall down to Earth
- ▮ Observe the path that different objects take to get down to Earth
- ▮ Think about which object exerts the most force on Earth

Experiment

- ▮ Follow directions on student sheet
- ▮ Drop all of the objects from 1 meter, record the times, weigh the objects
- ▮ Discuss Kinematic Equations

Example Calculation

- ▮ A lacrosse ball of mass $.4\text{kg}$, took $.5$ seconds to fall to earth from 1m high, while it was at rest. Given this information, what is the acceleration?